

Energy Efficiency At the Farm Level



**Interstate Power and Light Co.
(IPL), an Alliant Energy Company**

Kent Mowrer

February 11, 2009





Alliant Energy – who are we?

Alliant Energy serves over 1,000 cities and towns within its territory boundaries.





Alliant Energy – who are we?

We are an energy-services provider.

Our customers...

Wisconsin Power and Light (WP&L)

- 453,000 electric
- 179,000 natural gas customers

Interstate Power and Light (IP&L)

- 538,000 electric
- 239,000 natural gas customers







IPL Ag Program

- Agriculture Account Rep.
- Free, whole-farm electrical energy audits
- Ag-specific prescriptive rebates
- Specialized energy audits, e.g., USDA Section 9007 Energy Program
- Energy Consulting
 - New equipment comparisons
 - Recommendations of higher efficiency equipment



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2008 ENERGY-EFFICIENCY
Cash Rebates
AND OTHER ENERGY-SAVING SERVICES



Save money today and for years to come with energy-efficiency cash rebates and services from Alliant Energy.



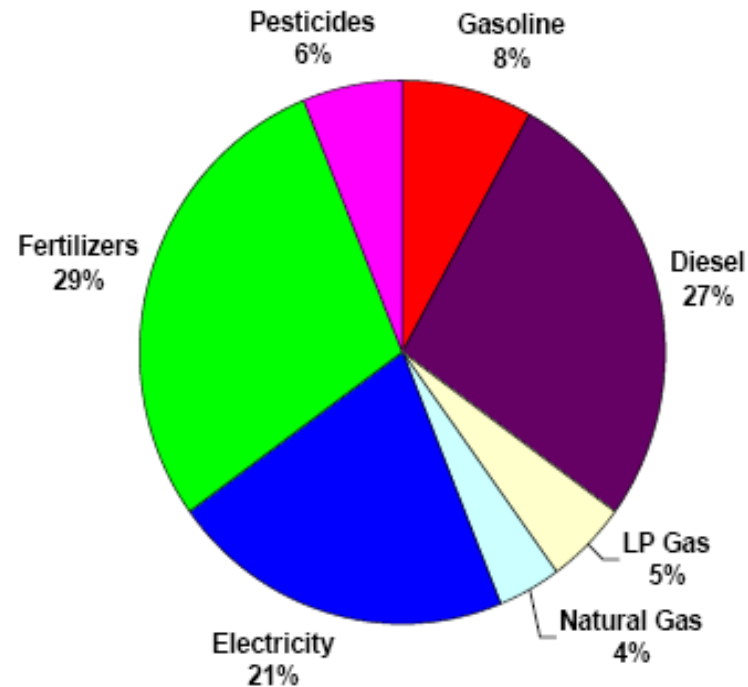


Farm Electrical Use

- Agriculture is a major user of energy.
- Accounts for about 15% of total farm cash expenses (includes electricity, fuel, & fertilizer)
- Electricity is important to agriculture
- > \$2 Billion spent for on-farm use in the U.S.

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Figure 2. Direct and Indirect Energy Inputs to Agriculture in 2004
(Total Energy Input = 1.7 Quads)



Source: Miranowski (2005)



When to invest in Energy Efficiency?

- Equipment needs to be replaced
- Expansion
- New construction
- Favorable economics (good times)
- Change in needs or processes
- Unfavorable economics (bad times)



What Equipment to look at on the farm?

- **Lighting & Heat lamps**
- **Ventilation fans**
- **Circulations fans**
- **Thermostat / environmental controls**
- **Feed systems**
- **Motors & VFD**
- **Grain dryers & grain monitoring equipment**
- **Automatic milker takeoffs**
- **Milk precoolers**
- **Heat reclaimers**
- **VSD Vacuum pumps**
- **Livestock waters**
- **Irrigation equipment**
- **Water heaters & cloths washers**





Good Place to Start: Farm Energy Study

- **Document past energy use**
- **Pinpoint energy waste in the operation**
- **Evaluate costs per unit – purchase options**
- **Identify energy-efficient technologies**
- **Provide summary report on energy savings potential.**
- **Identify rebate or grant opportunities: i.e. USDA 90-07 Federal Energy Efficiency Grants.**



Key Elements in Energy Management

- **Horsepower/wattage of equipment**
- **Hours of use**
- **Timing of use**
- **Electric rate**



Tools for Energy Efficiency – New Construction

Proposal For:

New Construction Efficiency Comparison

Date: August 5, 2005

Project Description: 2,400 hd new finisher

Recommended Energy Efficient Measures:

Measure	No. Of Units	Estimated installed cost/unit	Total installed cost	Available Incentive per animal/unit	Total Available Incentive per Measure	Total installed cost minus incentive	Total kWh Used	Annual Cost of Operation	Estimated kWh Saved per unit	Total kWh Saved	Annual Dollar Savings
Std./Existing											
Lighting											
1	Incand. Fixt. - Rm-Lighting	60	\$ 15.75	\$ 945.00		\$ 945.00	6,570	\$ 591.30			
2	CFL Fixture - Nite Lights	8	\$ 38.20	\$ 305.60	\$ 20.00 /light	\$ 160.00	981	\$ 88.30			
3											
4											
5											
Ventilation											
1	Pit Fan -	12	\$ 500.00	\$ 6,000.00		\$ 6,000.00	35,962	\$3,236.59			
2	End Wall Fans -	4	\$ 500.00	\$ 2,000.00			11,987	\$1,078.86			
3											
4											
5											
Recommended											
Lighting											
1	CFL Fixture - Rm-Lighting	60	\$ 38.20	\$ 2,292.00	\$ 20.00 /light	\$ 1,200.00	1,226	\$ 110.38		5343.6	\$ 480.92
2	CFL Fixture - Nite Lights	8	\$ 38.20	\$ 305.60	\$ 20.00 /light	\$ 160.00	981	\$ 88.30		0.0	\$ -
3											
4											
5											
Ventilation											
1	Pit Fan -	12	\$ 600.00	\$ 7,200.00	\$ 75.00 /fan	\$ 900.00	27,150	\$2,443.52		8811.9	\$ 793.07
2	End Wall Fans -	4	\$ 600.00	\$ 2,400.00	\$ 75.00 /fan	\$ 300.00	9,050	\$ 814.51		2937.3	\$ 264.36
3											
4											
5											

Total Standard Project Cost: \$ 9,250.60
 Incentive Amount:(If Any) \$ 160.00
 Net Standard Project Cost: \$ 7,090.60
 Total Annual kWh Usage: 55,501 kWh
 Total Annual kWh Cost: \$ 4,995.05

Total Recommended Project Cost: \$ 12,197.60
 Incentive Amount:(If Any) \$ 2,560.00
 Net Recommended Project Cost: \$ 9,637.60
 Total Annual kWh Usage: 38,408 kWh
 Total Annual kWh Cost: \$ 3,456.70
 Est. kWh Savings:(If Any) 17,093 kWh
 Est. Cost Savings:(If Any) \$ 1,538.35

Rec. Project Incremental Cost: \$2,547.00

Total Annual kWh Savings: 17,093 kWh

Total Annual Dollar Savings: \$ 1,538.35

Based on Avg. Elec. Cost of: \$ 0.090 \$/kWh

Energy Eff. Payback in Years: 1.7





New Construction - Summary

- Standard building specs. 55,501kWh
- \$4,995 @ \$.09
- Energy Efficiency recommendations
- 38,408kWh
- \$3,457 @ \$.09
 - Compact Fluorescent Lights(@2hrs op./day)
 - Fans w/better CFM/watt(24" fans 13 to 15)
 - Incremental cost \$2,547.00
 - **30% Energy Savings (\$1538.00)**
 - Payback 1.7yrs.



9007 Grant Energy Audit - Existing

Report Title: Existing 2 1/2pt grain drying system

Account Name & Address: Joe Farm
Energy Drive
Winnebago, MN 56088

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ALLIANT ENERGY

Date of Audit: July-08
 Type of Audit: Grain
 Account No.: 000000
 Meter No.: 0001

Description: Existing 2 1/2pt grain drying system
 Auditor's Initials: KM
 Transformer Size: KVA
 Rate: 410
 Phase: 1

Process Description	No. of pcs./motors	H.P.	Phase	Volt Rating or Actual	Amp Rating or Actual	Watt Rating or Actual	% Load	KW	hrs./day	# days /year	hrs. used/ year	Total kWh/ year	Comments
1 8" by 20" Wet auger	1	3	1	230			75%	2.0			17.0	34	Transfer wet bu from wet holding bin to dryer
2 Farm Fan CFAB 190 8" Leading Auger	1	2	1	230			75%	1.4			17.0	20	Leads wet bu during drying
3 Farm Fan CFAB 190 dryer fan motors	1	10	1	230			100%	8.5			80.5	703	Fan motor for corn drying
4 Farm Fan CFAB 190 metering rolls and unload auger	1	1.5	1	230			75%	1.1			80.5	88	Unloads dry bu from dryer to transfer auger
5 8" by 50" transfer auger	1	7.5	1	230			75%	4.8			80.5	400	Transfer dry bu from dryer to storage bins
6 North 30' bin 8" roof auger	1	5	1	230			75%	3.3			80.5	275	Transfer dry bu from transfer auger to north 30' bin
7 North 30' bin aeration fan	1	3	1	230			85%	2.3			80.5	187	Runs during bin fill
8 North 30' bin 8" unload auger	1	3	1	230			75%	2.0			7.5	15	Unload dry bu for transport
9 Field Dried Corn	1												
10 South 30' bin 8" roof auger	1	5	1	230			75%	3.3			12.0	39	Transfer dry bu from PTD auger to bin
11 South 30' bin aeration fan	1	3	1	230			85%	2.3	12.0	7.0	128.0	272	Runs during bin cooling
12 2" bin aeration fan	1	0.75	1	230			85%	0.6	12.0	7.0	84.0	82	Runs during bin cooling
13 North 30' bin 8" roof auger	1	5	1	230			75%	3.3			12.0	39	Fills North 30' bin with field dried corn
14 North 30' bin aeration fan	1	3	1	230			85%	2.3	12.0	7.0	84.0	190	Runs during bin cooling
15 North 30' bin 8" unload auger	1	3	1	230			75%	2.0			3.0	6	Unload dry bu for transport
16													
17													
18													
19													
20													
21													
Process kWh:												2,324	

Lighting - Description	No. Fixtures	No. Lamps/Fix- ture	Lamp Type (HPS, HID, Incand, Fluorescent)	Watts/ Lamp	Watts/ Fixture	KW	hrs./day	# days /season	hrs. used/ season	Total kWh	Comments
1 Harvest shed indoor light	1	1	Incand	100	100	0.075	5.0	8.0	40.0	4	Harvest shed light usage during harvest
2 Harvest shed yard light	1	1	Halogen	175	175	0.175	5.0	8.0	40.0	8	Harvest shed yard light usage during harvest
3											
4											
5											
6											
Lighting kWh:										12	

% of equipment operation were obtained and calculated from customer consultation and industry averages. *Actual usage will vary from year to year. No guarantees are made or implied as to future or current usage.

Ag Rep: _____ Total kWh: **2,336**





9007 Grant Energy Audit - Adjusted

Report Title: Adjusted 7pt grain drying system													
		Account Name & Address: Joe Farm Energy Drive Winnebago, MN 56000											
		Page 1 of 1											
Date of Audit: July 08		Description: Adjusted 7pt grain drying system											
Type of Audit: Grain		Auditor's Initials: KSM											
Account No.: 000000		Transformer Size: KVA											
Meter No.: 8001		Rate: 410											
		Phase: 1											
Process Description	No. of p.c.u./motors	H.P.	Phase	Volt Rating or Actual	Amp Rating or Actual	Watt Rating or Actual	% Load	KW	hrs./day	# days/year	hrs. used/year	Total kWh/year	Comments
1 6" by 20' Wet auger	1	3	1	230			75%	2.0			56.0	112	Transfer wet bu from wet holding bin to dryer
2 Farm Fan CFAB 190 6" Levelling Auger	1	2	1	230			75%	1.4			56.0	77	Levels wet bu during drying
3 Farm Fan CFAB 190 dryer fan motors	1	10	1	230			100%	8.5			528.5	4,600	Fan motor for corn drying
4 Farm Fan CFAB 190 metering rolls and unload auger	1	1.5	1	230			70%	1.1			528.5	677	Unloads dry bu from dryer to transfer auger
5 6" by 66' transfer auger	1	7.5	1	230			75%	4.9			528.5	2,817	Transfers dry bu from dryer to storage bins
6 North 36' bin 6" roof auger	1	5	1	230			75%	3.3			251.3	837	Transfer dry bu from transfer auger to North 36' bin
7 North 36' bin aeration fan	1	3	1	230			85%	2.3			323.3	732	Runs during bin fill and cooling
8 North 36' bin 6" unload auger	1	3	1	230			75%	2.0			12.0	24	Unloads dry bu for transport
9 South 36' bin 6" roof auger	1	5	1	230			75%	3.3			225.4	751	Transfer dry bu from transfer auger to South 36' bin
10 South 36' bin aeration fan	1	3	1	230			85%	2.3			287.4	673	Runs during bin fill and cooling
11 South 36' bin 6" unload auger	1	3	1	230			75%	2.0			0.5	10	Unloads dry bu for transport
12 27' bin aeration fan	1	0.75	1	230			85%	0.6			158.8	98	Runs during bin fill and cooling
13													
14													
15													
16													
17													
18													
19													
20													
21													
											Process kWh:	11,117	
Lighting - Description	No. Fixtures	No. Lamp/Fixture	Lamp Type (4-PS, HID, Incand, Fluorescent)	Watts/Lamp	Watts/Fixture	KW	hrs./day	# days	hrs. used/season	Total kWh	Comments		
1 Harvest shed indoor light	1	1	Incand	100	100	0.075	6.0	22.0	132.0	10	Harvest shed light usage during harvest		
2 Harvest shed yard light	1	1	Halogen	175	175	0.175	6.0	22.0	132.0	23	Harvest shed yard light usage during harvest		
3													
4													
5													
6													
										Lighting kWh	33		
<small>** Hrs. of equipment operation were obtained and calculated from customer consultation and industry averages. ***Actual usage will vary from year to year. No guarantees are made or implied as to future or current usage.</small>													
Ag Rep.											Total kWh:	11,150	





9007 Grant Energy Audit - New

Report Title: New Sukup T-16 7pt grain drying system

Account Name & Address: Joe Farm
Energy Drive
Winnebago, MN 56260

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ALLIANT ENERGY

Date of Audit: July-08
 Type of Audit: Grain
 Account No.: 000000
 Meter No.: 5001

Description: New Sukup T-16 7pt grain drying system
 Auditor's Initials: KM
 Transformer Size: KVA
 Rate: #10
 Phase: 1

Process Description	No. of pck./motors	H.P.	Phase	Volt Rating or Actual	Amp Rating or Actual	Watt Rating or Actual	% Load	KW	hrs./day	# days/year	hrs. used/year	Total kWh/year	Comments
1 6" by 20' Wet auger	1	3	1	230			75%	2.0					Eliminated
2 Farm Fan CFAB 190 6" Levelling Auger	1	2	1	230			75%	1.4					Eliminated
3 Farm Fan CFAB 190 dryer fan motors	1	10	1	230			100%	8.5					Eliminated
4 Farm Fan CFAB 190 metering rolls and unload auger	1	1.5	1	230			75%	1.1					Eliminated
5 6" by 55' transfer auger	1	7.5	1	230			75%	4.8					Eliminated
6 North 30' bin 8" roof auger	1	5	1	230			75%	3.3			62.9	210	Transfer dry bu from transfer auger to North 30' bin
7 North 30' bin aeration fan	1	3	1	230			85%	2.3			124.9	309	Runs during bin fill and cooling
8 North 30' bin 8" unload auger	1	3	1	230			75%	2.0			12.0	24	Unload dry bu for transport
9 South 30' bin 8" roof auger	1	5	1	230			75%	3.3			56.4	188	Transfer dry bu from transfer auger to South 30' bin
10 South 30' bin aeration fan	1	3	1	230			85%	2.3			128.4	291	Runs during bin fill and cooling
11 South 30' bin 8" unload auger	1	3	1	230			75%	2.0			9.5	19	Unload dry bu for transport
12 27' bin aeration fan	1	0.75	1	230			85%	0.6			111.7	69	Runs during bin fill and cooling
13 New Equipment													
14 New 8" by 30' wet corn auger	1	7.5	1	230			75%	4.8			56.0	258	Transfer wet bu from wet holding bin to dryer
15 New Sukup T-16 Load Auger	1	3	1	230			75%	1.9			68.0	108	Levels wet bu in Sukup T-16 dryer
16 New Sukup T-16 dryer fan motor	1	16	1	230			100%	12.0			125.1	1,622	Fan motors for corn drying
17 New Sukup T-16 unload auger	1	3	1	230			75%	1.9			135.1	283	Unload dry bu from New Sukup T-16 to transfer auger
18 New 8" by 61' transfer auger	1	10	1	230			75%	8.1			125.1	824	Transfer dry bu from dryer to storage bin
19													
20													
21													
Process kWh:												4,171	

Lighting - Description	No. Fixtures	No. Lamp/Fixture	Lamp Type (HPS, HID, Incand, Fluorescent)	Watts/Lamp	Watts/Fixture	KW	hrs./day	# days	hrs. used/season	Total kWh	Comments
1 Harvest shed indoor light	1	1	Incand	100	100	0.075	8.0	8.0	35.0	3	Harvest shed light usage during harvest
2 Harvest shed yard light	1	1	Halogen	175	175	0.175	0.0	6.0	36.0	6	Harvest shed yard light usage during harvest
3											
4											
5											
6											
Lighting kWh:										9	

** Hrs. of equipment operation were obtained and calculated from customer consultation and industry averages. ** Actual usage will vary from year to year. No guarantees are made or implied as to future or current usage.

Aj Rep: [Redacted] Total kWh: **4,180**





9007 Grant Energy Audit - Summary

Joe Farm		Electrical Audit Summary				
	Existing System	Existing System Adjusted to 7pts.	New System			
Calculated drying kWh use	2,336	11,150	4,160	kWh savings		6,969
Drying mos. cost / kWh	\$0.1065	\$0.0700	\$0.0700			
Total electric cost	\$248.80	\$780.47	\$292.62	\$\$ Electric Cost Savings		\$487.86
Total bushels dried	33,000	103,045	103,045	% savings		62.51%
kWh cost / bu dried	\$0.0075	\$0.0076	\$0.00284			
Points moisture removed/bu.	2.5	7.0	7.0			
Total pts. removed	82,500	721,315	721,315			
Bu dried per hr	400	191	763			
Total drying hours	83	540	135			
kWh / bu. dried	0.071	0.108	0.041			
Bushels dried / kWh	14.124	9.242	24.651			
BTU's / kWh	3412	3412	3412			
BTU's / bu dried	242	389	138			
Total electrical BTU's	7,972,054	38,042,470	14,262,892	Electrical BTU Savings		23,779,578
				% Elect. BTU Savings		62.51%
		Gas Audit Summary				
	Existing Audited	Existing Adjusted	New Drying System			
Gallons LP used	1,900.0	12,424.9	7,879.9	Gallons LP Saved		4,745
Cost per gallon	\$ 1.600	\$ 2.00	\$ 2.00			
Total Gas cost	\$3,040.00	\$24,849.82	\$15,359.75	\$\$ Gas Cost Savings		\$9,490.07
Total bu. Dried	33,000.00	103,045.00	103,045.00	% savings		38.19%
Gas cost / bu dried	\$ 0.092	\$ 0.241	\$ 0.149			
Points moisture removed/bu.	2.50	7.00	7.00			
Gas cost / pt	\$ 0.037	\$ 0.034	\$ 0.021			
Total pts removed	82,500	721,315	721,315			
Bu Dried / hr	400	191	763			
Total drying hrs	83	540	135			
BTU's per hour	2,114,182	2,114,182	5,220,288			
BTU's / gallon	91,800	91,800	91,800			
BTU's / bu dried	5,285	11,069	6,842			
Total BTU's	174,420,000	1,140,606,825	705,012,552	Gas BTU Savings		435,594,074
				% Gas BTU Savings		38.19%
		Combined Savings Summary			New System Cost(\$\$\$) Savings	
	Existing Audited	Existing Adjusted	New Drying System			
Total Electric & Gas Cost	\$3,288.80	\$25,630.29	\$15,652.37	Total Cost Old System		\$25,630.29
Total Cost / Bu. Dried	\$0.100	\$0.249	\$0.152	Total Cost New System		\$15,652.37
Total Cost / pt moist. rem.	\$0.040	\$0.036	\$0.022	Total Cost Savings		\$9,977.92
				\$\$ Savings / Bu. Dried		\$0.097
Total Electric & Gas BTU's	182,392,054	1,178,649,095	719,275,444	% Total Cost Savings		38.93%
Total BTU's / Bu. Dried	5,527	11,438	6,980	New System Energy(BTU's) Savings		
Total BTU's / pt. moist. rem.	2211	1634	997	Total BTU's Old System		1,178,649,095
				Total BTU's New System		719,275,444
				Total BTU's Saved		459,373,651
				% BTU Savings		38.97%
				Project Cost		\$56,000.00
				Payback (yrs)		5.5



Bottom Line Benefits

- **Lower energy consumption = lower energy costs**
- **Rebates and grants provide money back for energy efficient equipment installations**
- **Pay for projects via positive cash flow from savings**
- **Reduce operating costs long-term**
- **Increase profits**



Where do we go from here??

- Energy Efficiency does save \$\$ when done correctly.
- Energy Efficiency is one piece of the energy puzzle.
- Payback generally quicker, do first.
- Hasn't been much emphasis in Ag market in the past. There is a lot of potential!!
- Challenges
 - Change way of thinking. (Customers, builders, designers, equipment dealers)



Thank You!



- 24 x 7 call center - 1-800-ALLIANT (255-4268)
- www.alliantenergy.com
- IPL Ag Reps
 - **Steve Fredrick** – energy efficiency and stray voltage
Decorah, IA 563.382.1621
 - **Tony Harvey** – stray voltage and dairy industry
Dubuque, IA 563.587.4553
 - **Kent Mowrer** – energy efficiency
Ames, IA 515.268.3440
 - **Adam Kramer** – energy efficiency
Cedar Rapids, IA 319.786.7293

